Name: Date:

Exam: Function Reflections (Solution version 12)

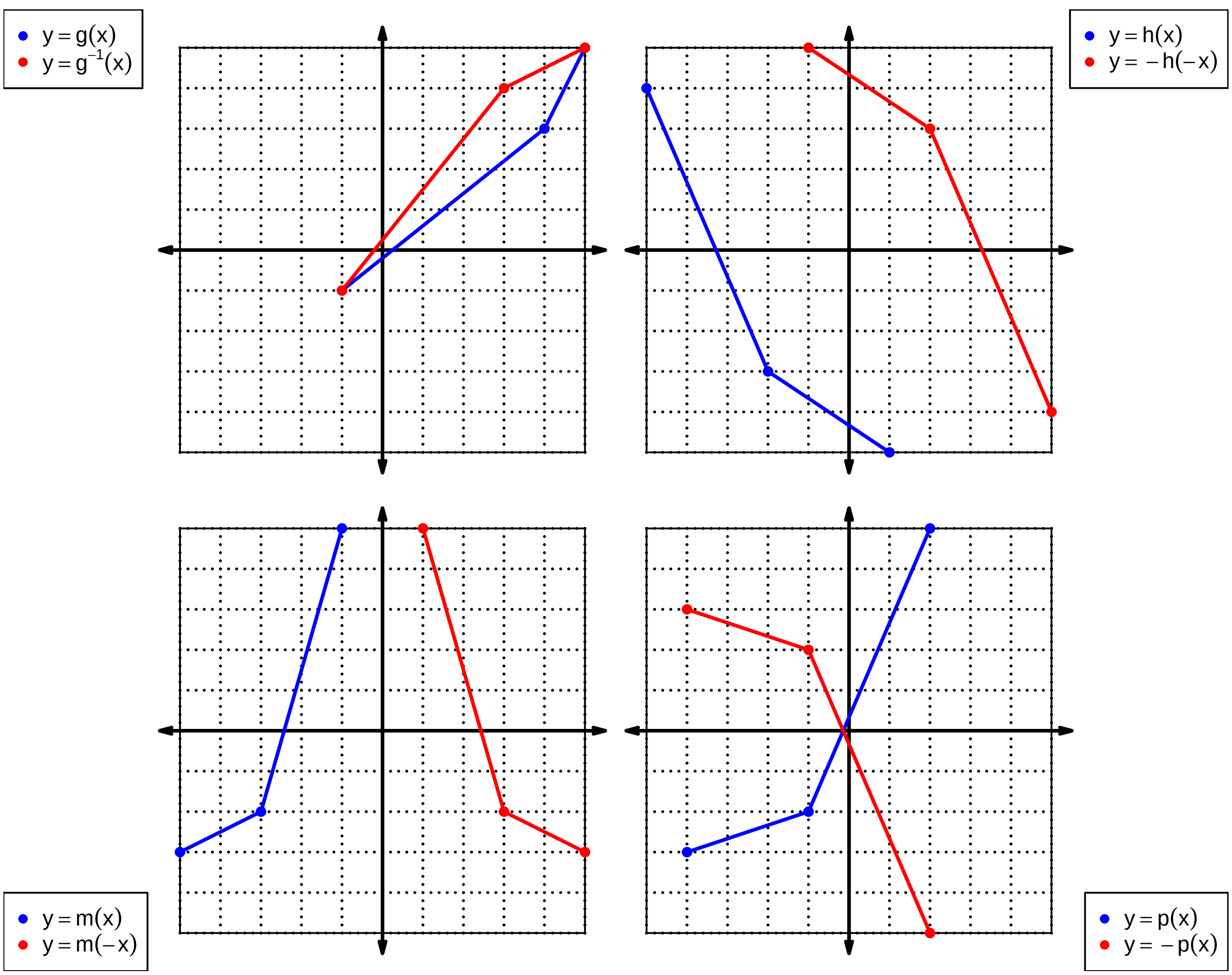
1. Let function f be defined by the polynomial below:

$$f(x) \; = \; 3x^5 - 8x^4 + 4x^3 - 6x^2 + 2x - 9$$

Draw lines that match each function reflection with its polynomial:

Reflections	Polynomials
$-f(x)$	$-3x^5+8x^4-4x^3+6x^2-2x+9$
$-f(-x)$	$-3x^5-8x^4-4x^3-6x^2-2x-9$
$f(-x)$	$3x^5+8x^4+4x^3+6x^2+2x+9$

2. In each xy plane shown below, a function is graphed with blue. Draw the indicated reflections (as a second curve, indicated in legend) with black (or with whatever you have). The x axis is horizontal and the y axis is vertical (as typical), and the scale is equal on both axes.



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For all questions on this page, the functions f, g, and h are defined by the table below.

x	$f(x)$	$g(x)$	$h(x)$
1	9	6	4
2	1	3	7
3	2	8	1
4	5	7	3
5	3	9	8
6	4	5	5
7	8	2	6
8	6	1	9
9	7	4	2

3. Evaluate $h(7)$.

$$h(7) = 6$$

4. Evaluate $g^{-1}(4)$.

$$g^{-1}(4) = 9$$

5. By filling more rows of the table, it is possible to make function g **even**. If that were done, what would be the value of $g(-8)$?

If function g is even, then

$$g(-8) = 1$$

6. By filling more rows of the table, it is possible to make function f **odd**. If that were done, what would be the value of $f(-5)$?

If function f is odd, then

$$f(-5) = -3$$

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7. A function, f, is **even** if $f(x) = f(-x)$ for all x in the domain. A function, g, is **odd** if $g(x) = -g(-x)$ for all x in the domain.
   Let polynomial p be defined with the following equation:

$$p(x) \;=\; x^3 + x$$

   a. Express $p(-x)$ as a polynomial in standard form.

$$\begin{aligned} p(-x) &= (-x)^3 + (-x) \\ p(-x) &= -x^3 - x \end{aligned}$$

   b. Express $-p(-x)$ as a polynomial in standard form.

$$\begin{aligned} -p(-x) &= -\left(-x^3 - x\right) \\ -p(-x) &= x^3 + x \end{aligned}$$

   c. Is polynomial p even, odd, or neither?

   odd

   d. Explain how you know the answer to part c.

   We see that $p(x) = -p(-x)$ for all x because $p(x)$ and $-p(-x)$ are equivalent polynomials. Thus function p satisfies the criterion for being an odd function.

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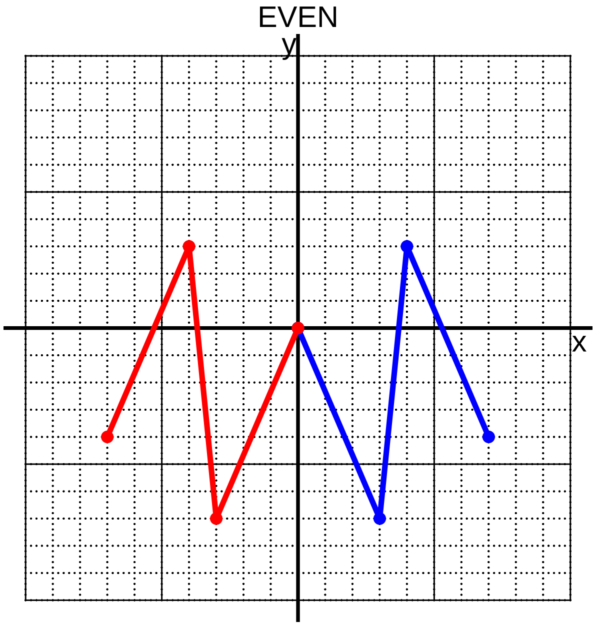
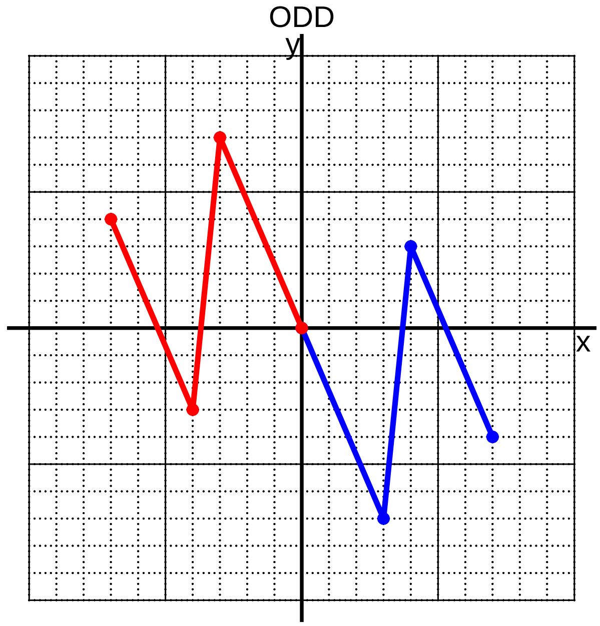
8. I have drawn half of a function. Draw the other half to make it even or odd.





9. Let function f be defined with the equation below.

$$f(x) = 9x + 3$$

a. Evaluate $f(10)$.

step 1: multiply by 9
step 2: add 3

$$f(10) = 9(10) + 3$$
$$f(10) = 93$$

b. Evaluate $f^{-1}(66)$.

step 1: subtract 3
step 2: divide by 9

$$f^{-1}(x) = \frac{x-3}{9}$$
$$f^{-1}(66) = \frac{(66)-3}{9}$$
$$f^{-1}(66) = 7$$

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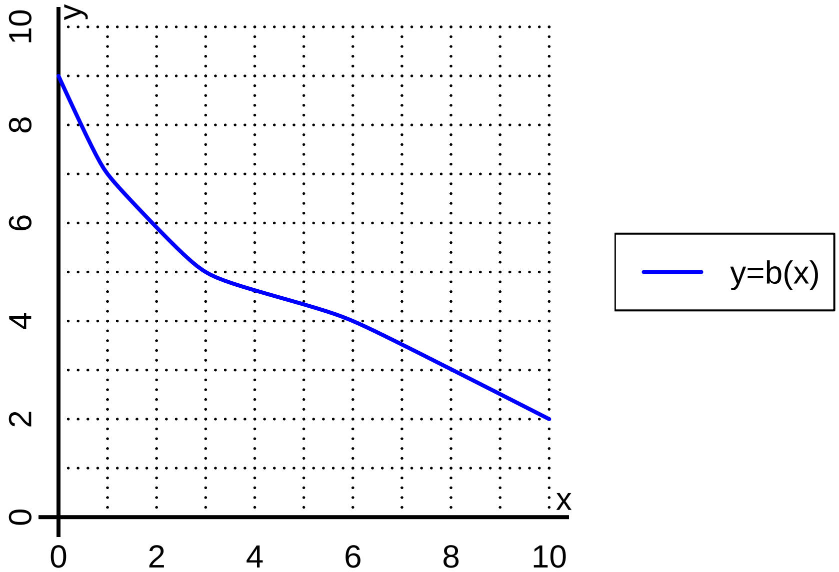
10. The function b is represented by the curve $y = b(x)$ graphed below.



a. Evaluate $b(6)$.

$$b(6) \;=\; 4$$

b. Evaluate $b^{-1}(5)$.

$$b^{-1}(5) \;=\; 3$$

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11. Function f is defined by the table below.

    a. Complete the columns for $-f(x)$ and $f(-x)$ and $-f(-x)$.

x	$f(x)$	$-f(x)$	$f(-x)$	$-f(-x)$
-2	-3	3	-3	3
-1	5	-5	5	-5
0	0	0	0	0
1	5	-5	5	-5
2	-3	3	-3	3

b. Is function f even, odd, or neither?

even

c. How do you know the answer to part b?

Function f is even because column $f(-x)$ matches column $f(x)$ exactly.